

Patterns of death due to blunt force trauma in the West Metropole of the City of Cape Town, South Africa

by

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Abstract

There is currently a paucity of information regarding the prevalence and characteristics associated with blunt force trauma related homicides in South Africa. Information relating to the patterns of blunt force trauma could assist in the implementation of appropriate interventions targeted at specific areas or individuals. Furthermore it can direct research toward topics in blunt force trauma which are in need of investigation. As such the primary objective of this study was to determine the prevalence of blunt force trauma related homicides in the West Metropole of the City of Cape Town, South Africa. The secondary objective was to describe the characteristics associated with blunt force trauma related homicides in the West Metropole of the City of Cape Town, South Africa.

This thesis begins by defining blunt force wounds and comparing and contrasting the prevalence and documented characteristics associated with blunt force trauma nationally as well as internationally. Blunt force wounds occur when the body comes into contact with a blunt object at great force. Homicides by blunt force trauma are usually the result of assaults with fists, feet, bats or clubs, etc. Common wounds associated with blunt force assaults are contusions, lacerations and in some cases, bone fractures. In fatal blunt force assaults, these wounds tend to be located primarily on the head region.

Salt River Mortuary receives cases from the West Metropole of the City of Cape Town, hence the results of this thesis are considered in the context of this area. This region is comprised of areas with diverse socio-economic status' and heterogeneous crime rates. The study was a retrospective review of autopsy reports obtained from Salt River mortuary from 1 January 2013 to 31 December 2014. The prevalence of blunt force trauma was considered for unnatural deaths with a focus on homicide. The inclusion criteria were cases where the cause of death was blunt force trauma as determined by the pathologist. Cases in which the death was not caused solely by blunt force trauma were classified as combination deaths, and cases involving deaths due to blunt force trauma as a result of falling from a height, train-related, pedestrian or motor vehicle accidents were excluded.

A total of 3346 and 3461 cases of unnatural deaths occurred in the West Metropole of the City of Cape Town in 2013 and 2014 respectively. 247 (7.4%) cases in 2013 and 277 (8%) cases in 2014 involved blunt force injuries, and of these cases 183 (5.5%) in 2013 and 201 (5.8%) in 2014 were classified as homicides. The results of the characteristics of blunt force homicide analysed in this study broadly concur with previous studies undertaken in South Africa, with some areas of divergence. Additional features that have not been extensively covered in previous studies also emerged, which could possibly form the basis for future investigations.

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Chapter One: Research Proposal

1.1. Purpose

There is currently a paucity of information reported on the characteristics of blunt force trauma in South Africa, and as such the primary objective of this study is to determine the prevalence of blunt force trauma-related fatalities in the West Metropole of the City of Cape Town. The secondary objective is to describe the characteristics associated with blunt force trauma-related fatalities in the West Metropole of the City of Cape Town.

1.2. Background

Trauma can be divided into three main forms; namely blunt, sharp and ballistic. The second leading manner of death in Cape Town, South Africa, is murder (1) and blunt force trauma forms a considerable portion of these deaths (2). The most recent figure reported on the prevalence of deaths due to blunt force trauma in South Africa was 10.6%, based on data from the year 2000 (3). However, this analysis did not examine the characteristics of these cases. In South Africa there is currently a dearth of information regarding the features associated with deaths caused by blunt force trauma. Information relating to the features of blunt force trauma would allow us to focus resources and research toward particular aspects of blunt force trauma, which could help to better analyse or prevent such incidents from occurring in the future. Practically, this could include the proposal of interventions such as an increase in police presence at times of increased risk or in areas of high risk.

Fatal blunt force trauma injuries are usually the consequence of blows from fists and feet or a variety of blunt implements such as household hammers, pool cues or bats (4). Typically the manner of death associated with blunt force trauma is murder (other than in cases of motor vehicle collisions) however cases of suicide by blunt force trauma, although rare, have been noted (5). Literature on fatal blunt force trauma tends to focus on age and gender, location of injuries, number of body regions involved, defence injuries, weapon, assailant-victim relationship, location of the crime scene (6) and further toxicological analysis of the victim's tissue (7). The incidence of blunt force trauma varies widely among countries (4,6). There is currently a need for reliable information relating to the South African context. Retrospective studies conducted in Germany, India and

Scandinavia have reported that blunt force trauma constitutes respectively, 51%, 41% and 18% of homicide cases in the periods studied (6,8,9).

A broad age spectrum exists for victims of blunt force trauma (9), however, the largest group of victims are commonly seen in the 20 – 40 years age bracket (4,6,8,10). Males tend more frequently to be the victims of blunt force trauma compared to females (4,6,8,10). There is little focus in the literature on racial groups affected by fatal blunt force trauma, possibly because race depends heavily on the geographical area of investigation (4).

The literature varies in regard to the reported region of the body involved in blunt force trauma as well as the type and number of injuries described on the victims. In a 2003 study, multiple regions of the body were affected in blunt force injury (8), whereas another investigation found that the head was typically the principal region of the body involved in blunt force injury (11). It is not uncommon for victims of blunt force trauma to display defensive injuries in addition to those sustained during the attack; these injuries are often abraded and contused wounds to the forearm (6).

The relationship of the assailant and victim differs between countries and gender groups. Ambade and Godbole (2006) reported, in an Indian population, that the majority of victims had no familial connection to their assailant (6). However in the Scandinavian (8) and German populations (9) it was found that female victims were primarily attacked by their spouses while male victims had no prior relationship with their attacker(s). Consequently female victims are often killed in their domicile, while a large proportion of males are killed outdoors or away from their homes (4,8,9).

A number of weapons may be used to inflict blunt force trauma. Typically, a single known weapon is often the cause of injury (6). A retrospective study conducted in Ireland revealed that 66% of cases of blunt force head trauma a weapon of origin was known (11). However, a Scandinavian investigation discovered that there is often little substantial information regarding the weapon used (8). When the weapon(s) used are known, they are frequently common household objects (7,9) or the assailants' fists and/or shod feet (4,8).

1.3. Methodology

1.3.1. Study design

The study will be a retrospective review of autopsy reports obtained from Salt River mortuary for two years from 1 January 2012 to 31 December 2012 and 1 January 2013 to 31 December 2013. The prevalence of blunt force trauma-related fatalities in the West Metropole of the City of Cape Town will be calculated for each of the two years (2012 and 2013) and the study will focus on the following characteristics as shown in Table 1-1 below:

Table 1-1. Variable types associated with the characteristics of blunt force trauma.

Variable	Type
Age	Numerical continuous
Gender	Binary
Day and month of death	Categorical
Number of injuries	Numerical continuous
Location of injuries	Categorical
Number of body regions involved	Numerical continuous
Defence injuries	Binary
Assailant-victim relationship	Categorical
Physical crime scene location	Categorical
Geographical crime scene area	Categorical
Presence of alcohol in victim	Binary
Manner of death	Categorical
Suspected weapon	Categorical
Signs of medical intervention	Binary

1.3.2. Characteristics of the study population

The study will focus on cases of unnatural death from Salt River mortuary from the years 2012 and 2013. The inclusion criteria will be cases where the cause of death is blunt force trauma as determined by the pathologist; these cases will be isolated to calculate the prevalence of blunt force trauma in the West Metropole of the City of Cape Town. Cases in which the death was not caused solely by blunt force trauma will be included in the analysis and classified as mixed cases. Cases involving deaths due to blunt force trauma as a result of train-related, pedestrian or motor vehicle accidents will be excluded.

1.3.3. Research procedures and data collection methods

In order to accurately calculate the prevalence of blunt force trauma fatalities for each of the two years, all the autopsy reports pertaining to those respective years will be considered. Salt River mortuary serves the West Metropole of the City of Cape Town and receives approximately 3000 cases per year (12). Hence, the prevalence for blunt force trauma-related fatalities will be calculated for the years 2012 and 2013. Characteristic data for those cases will be collected as pertaining to the variables stated above in Table 1-1.

1.3.4. Data analysis

Forensic Pathology Services, Western Cape Government, Department of Health maintains a database of all autopsies conducted. Access to this database is restricted. This database will be used to determine the prevalence of blunt force trauma and to determine cases for further analysis. The information supplied by the database was originally collected under the auspices of the Inquest Act where no consent is necessary. Furthermore, all the information for this study was originally collected as part of routine operational processes of a database (13). In cases where data is missing or omitted in the database information will be obtained from the autopsy report of the case. Data will be captured at UCT in a secure room with restricted access. In order to protect the sensitive information contained in the autopsy reports the following precautions will be taken: the data used will not be freely available, and all names will be omitted and case numbers will be anonymised. In each case, the characteristic data (Table 1-1) will be collected and recorded into a Microsoft® Office Excel® 2013 (Microsoft, Redmond, Washington, US) database. Statistical calculations will be performed using Stata Ver 13.1 (StataCorp, TX, USA). Descriptive statistics will be used to identify the presence of patterns and commonalities for each characteristic.

1.3.5. Estimated costs

There are no foreseeable expenses involved in this study because it is retrospective in nature, hence no reagents or equipment are required. The software used to perform the

statistical analysis is freely available to UCT staff members and students and therefore adds no cost to the study.

1.4. Description of Risks and Benefits

The study is a retrospective review of the autopsy reports associated with blunt force trauma fatalities from Salt River mortuary, hence there are no physical risks involved. However, the information contained in the autopsy reports is highly sensitive and as such anonymity and confidentiality is critical and will be maintained as described in the data analysis section. The information gained from this study will provide current information regarding the prevalence and characteristics of blunt force trauma-related fatalities in the West Metropole of the City of Cape Town. This data will provide insight into the victims of blunt force trauma and highlight areas for further study.

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1.6. Amendments to Proposal

The following amendments were made to the research proposal:

1.6.1. Study Period

The period of study was shifted from 2012-2013 to 2013-2014 in order to cover the most recent available data. It was originally thought that blood alcohol toxicology results would not be available for the year 2014. However, on investigation it was discovered that these results were available for 2014.

1.6.2. Characteristics

The assailant-victim relationship and suspected weapon were excluded from the analysis due to inconsistent reporting. An analysis of the presence of signs of medical intervention was excluded from the dissertation because there was insufficient information available on the extent of medical intervention for each case. Whilst this information is valuable, further study which exceeds the bounds of a mini-thesis is required in order to provide valuable information relating to this characteristic.

Chapter Two: Literature Review

2.1. Trauma Morphology

Trauma is commonly categorised into three groups according to the mechanisms of trauma, namely, blunt, sharp and ballistic trauma. Extensive research on wound pathology has been conducted to better differentiate between blunt, sharp and ballistic trauma in order to contribute to the determination of the cause and manner of death as well as to provide information pertaining to the weapon type so as to clarify the events surrounding death (1,2). However, wound morphology is governed by the interaction of variables such as force, tissue structure and surface area resulting in wound pathology being more effectively viewed as a continuum, rather than mutually exclusive categories (3).

Typical blunt trauma injuries include abrasions, contusions and lacerations. The most superficial of these wounds are abrasions which are described as shallow wounding of the skin such as scratches and grazes. Scratches are linear in appearance whilst grazes typically affect a wider surface area. In an assault with a blunt object these wounds can be created when the victim receives a glancing blow from a rough weapon such as a brick or falling or being dragged on the ground. Cases where the skin receives vertical impact can result in crush abrasions whereby the epidermis is crushed leaving an imprint of the impacting object. If the force of the object is concentrated on a small surface area, the skin can be perforated resulting in a puncture abrasion. Artefactual abrasions can confuse determination of the cause of death and may occur as a result of the body being handled after death or by insect activity.

Contusions are commonly seen in conjunction with abrasions and can be visible during external examination on the skin or visible on internal examination affecting internal tissues. Blunt force attacks commonly result in contused injuries because the blunt object is not sharp enough to pierce the skin resulting in blood from damaged vessels collecting under the skin or internally (4). Patterned bruises can provide information regarding the object used in the attack, tramline bruises are often present on victims of attacks with cylindrical objects or straps as are commonly utilised in impromptu fights and assaults (4–6).

Lacerations are the third major type of blunt force injury that result in the full thickness of the skin being penetrated. They can be distinguished from sharp force incisions because of rough edges, crushed margins, and tissue bridges forming when the skin tears, all of which are not seen in cleanly sliced incision wounds. Tear and crush forces are associated with laceration wounds but the degree to which this is seen depends on the angle and body location of injury, as well as the force and object with which it was inflicted. Lacerations are commonly located in areas with a firm underlying base such as the skull or shoulder blade, and it is rare to find lacerations on softer areas such as the abdomen or buttocks where there is no underlying bone immediately beneath the skin's surface which compresses the skin against the object (4). However, "flaying injuries" are common to motor vehicle accident victims when the rotary action of the wheel rolls a large area of tissue and skin off a limb. If the deeper underlying tissue is separated from the skin, and the skin remains unbroken the injury will be classified as decollement. If utilised with sufficient force, some objects such as a hammer or steel capped boots will produce patterned laceration injuries which are commonly associated with bruises of similar patterns. Blunt penetration injuries, such as hook lacerations, can occur as a result of injury from metal spikes, garden forks, screwdrivers are a cross between incisions and lacerations, although they commonly show more features of the former (4).

In contrast to blunt trauma, ballistic trauma often results in injury patterns that are usually characterised by rounded entrance wounds and stellate exit wounds (7), but in exceptional cases there can be an absence of a definitive site of impact making classification challenging. In these cases wounds can be distinguished from blunt force trauma by studying the dissimilar fracture pattern of the underlying bone (1). The presence of cut marks on bone can be indicative of sharp force trauma as well as provide information that links the injury to the weapon type (1), however, these wounds can be misleading because similar wounds can be the result of injury by blunt objects meaning sharp objects can create wounds that resemble blunt trauma depending on the location of injury (8,9). Examples of such injuries include chop wounds due to an axe as well as injuries due to motorboat propellers. Furthermore, sharp objects can also be responsible for inflicting blunt trauma such as tear or crush wounds associated with underlying bone fractures (8,9). These similarities in wound morphology pose a challenge to pathologists

when commenting on weapon types and peri-mortem activities and there can be a lack of consistency in the description of the trauma analyses (8).

The wound morphology in blunt force trauma cases varies, based on the weapon used and the force with which it was applied (1,10). Therefore, it is possible for blunt force trauma to occasionally leave no visible trace on the exterior of the body, resulting in the diagnosis of the mechanism of injury only becoming apparent after an internal examination of the tissue and bones (9). Further investigative complications can arise because blunt force attacks do not always result in immediate death. In some cases death may occur days, weeks or even months after an attack, causing difficulty in determining if an individual is at fault. The delayed onset of death from blunt force injuries can be due to thromboembolisms, subarachnoid haemorrhages and/or diffuse axonal injuries depending on the nature of the attack. A severe beating can result in fatal thromboembolisms which can occur between 2 to 90 days after injury (11). Furthermore, mechanical disintegration of the underlying adipose tissue or embolization of marrow fat from the long bones in cases of fracture, could lead to potentially fatal fat embolisms (12). Some cases of blunt force head injury result in subarachnoid haemorrhages with no external signs of trauma, hence the victim does not seek medical help after the incident but will succumb to headaches, vomiting, unconsciousness and eventually death at a variable time after the incident (13). Diffuse axonal injury can also manifest sometime after a mild or severe head injury with no visible signs of trauma making diagnosis of death difficult without a medical history (13).

Bone is a viscoelastic material exhibiting different responses dependant on the load applied. The fracture mechanics of bone under different loading conditions may therefore be used to further differentiate between blunt and ballistic trauma. Under high rates of loading such as those seen in ballistic trauma, bone behaves as a brittle material and fracture quickly under a load (14). Bone is stronger under compression than tension and therefore will first fail under tension. It has also been noted that the type of bevelling seen in concentric fractures differs between blunt and ballistic trauma. Internal bevelling is associated with concentric fracture in blunt trauma, whilst ballistic trauma produces concentric fractures that demonstrate external bevelling. However, the production of

bone fractures is complex and depends largely on the interaction of extrinsic and intrinsic factors, often making interpretation difficult (15,16).

2.2. Epidemiology and Patterns of Blunt Force Trauma

Fatal blunt force trauma injuries are usually the consequence of blows from fists and feet or a variety of blunt implements such as household hammers, pool cues or bats (17). A number of weapons may be used to inflict blunt force trauma. Often, a single known weapon is the cause of injury (18). A retrospective study conducted in Ireland revealed that in 66% of cases of blunt force head trauma, a weapon of origin was known (9). However, a Scandinavian investigation discovered that there was often little substantial information regarding the weapon used (19). When the weapon(s) used are known, they are frequently common household objects (20,21) or the assailants' fists and/or shod feet (17,19).

The typical manners of death associated with blunt force trauma are murder (by means of assault), suicide by jumping from a height and accidents by way of falling or motor vehicle collisions. Rare cases of suicide by multiple blows to the head have however been recorded in which the victim was mentally unstable (22). Literature on fatal blunt force trauma tends to focus on age, gender, location of injuries, number of body regions involved, defence injuries, weapon, assailant-victim relationship, location of the crime scene and further toxicological analysis of the victim's tissue (18,21). However, direct comparison of reported results is not always possible because in South Africa there is a dearth of centralised information pertaining to blunt force deaths, hence research is frequently compiled from a variety of data sources such as police dockets, hospital records and autopsy reports (23). Even with the use of multiple data sources, there is still a lack of consistent reporting for some characteristics such as the location of an attack versus the location of death, assailant-victim relationship and weapon type used. To positively identify weapon types, extensive DNA testing of the weapon and victim is required. As it stands, without such tests, a pathologist can only comment on whether the injuries are in accordance with a certain weapon or the weapon found at the scene (24). Furthermore, very few studies report the statistical significance of their results and

proportions are generally not compared to population data to determine whether the distribution observed in the study is merely due to population proportions.

2.2.1. Prevalence

The incidence of blunt force trauma varies widely among countries (17,18). Retrospective studies conducted in Germany, India and Scandinavia have reported that blunt force trauma constitutes 51%, 41% and 18% respectively, of homicide cases in the periods studied (18–20). There is currently a need for reliable centralised information relating to blunt force trauma in a South African context. From a global perspective South Africa has an exceptionally high rate of inter-personal violence (25). The second leading manner of death in Cape Town, South Africa, is murder (26,27) and blunt force trauma forms a considerable portion of these deaths (28).

There is a dearth of consolidated data regarding the prevalence and characteristics of blunt force trauma in South Africa because many studies that report the prevalence of homicide rely on information from a variety of record sources as stated above (27). A 1994 cross-sectional study compiling data from death registers, autopsy reports, police dockets and laboratory documents from Salt River and Tygerberg mortuaries, in Cape Town, South Africa found an overall homicide rate of 46% with blunt force trauma accounting for 13% of homicide related deaths (28). A further study conducted in 2003 investigated violence and mortality across 36 mortuaries in 7 of the 9 provinces in South Africa (23). This study reported the prevalence of deaths due to blunt force trauma in South Africa to be 14% (23). A more recent study conducted in Pretoria, South Africa in 2014, produced a figure of 6.19% of unnatural deaths caused by blunt force trauma (29). This study performed an analysis of non-natural deaths for which alcohol analysis was performed, in which approximately 62% of cases had samples taken for alcohol analysis.

While the above results are useful for studying the impact of blunt force trauma in South Africa there is a notable lack in centralised data on the prevalence and characteristics of blunt force trauma homicide and relatively few studies investigate homicidal blunt force trauma as a unique entity (26). Information relating to the features of blunt force trauma would allow for the focus of resources and research toward particular aspects of blunt

force trauma, which could help to better analyse or prevent such incidents from occurring in the future.

2.2.2. Age

A broad age spectrum exists for victims of blunt force trauma (20). However, the largest group of victims are commonly seen in the 20 – 40 years age bracket (17–19,30). In a 1994 South African study by Lerer et al. (28) the blunt force trauma homicide victims had a wide age range from 0 – >75 years with 30% of the victims falling within the 25 – 34 years age category. A similar pattern was seen nationally with most homicide victims falling within the 25 – 29 years age group (23). In accordance with the South African studies, wide age ranges were present in India and England but dissimilarly the majority of victims were slightly older than those seen in South Africa (23,28). The majority being between 31– 40 and 30 – 39 years of age in India and England respectively (17,18). A conceivable explanation for this could be the involvement of younger people in gang activity and violence in South Africa, and particularly in the Western Cape (5,6,31).

2.2.3. Gender

Globally, males tend more frequently to be the victims of blunt force trauma than females (17–19,30). In the Cape Metropole in 1994, 13% of the homicide victims were female with 87% being male (28). This was mirrored in an Indian study which reported the same male to female ratio for blunt force homicide victims (18). Similarly a study of non-firearm homicides in England showed more male than female victims however, with a ratio of 2:1 it is to a lesser extent than the Indian and South African studies (17). There is a wide array of research on this global trend and the explanations are often multidimensional and grounded on complex socio-biological interactions (32).

A United States study used the evolutionary theory of sexual selection to explain the overrepresentation of young, unemployed, single male homicide victims and offenders (33). They use the term hegemonic masculinity to describe young men tending to be more aggressive and competitive, hence more likely to be victims or perpetrators of violence, because of the evolutionary context of reproductive competition (31). Evolutionary

theory was also included in a model developed using data from 18 developed democracies whereby the gender-gap associated with homicide was attributed to gender differences in societal roles and status (32). The model included the degree of exposure to potential offenders and the prevalence of conflict amongst the population. In the South African context there are high levels of conflict associated with male dominance within populations (31).

These explanations are applicable to homicide in general on a global scale, hence could be used to explain the high numbers of South African men killed by blunt force trauma as opposed to women. Despite the overrepresentation of male victims, the circumstances surrounding death often differ between men and women. When studying the crime scene location on a national scale in South Africa, a much greater proportion of female victims were murdered in private homes than male victims (42% versus 32%) (23). This could be indicative of signs of domestic violence which is affected by issues of under-reporting and is often difficult to identify retrospectively due to the lack of information regarding victim-perpetrator relationship in homicide data (25).

2.2.4. Day and month of death

According to the most recent data there is a peak in the number of homicides during the weekend days of Saturday and Sunday, with this being particularly noticeable in Cape Town (23). These results are contradictory to those of non-firearm related homicides in England which saw no association between homicide and the day of the week (17). From a seasonal perspective in Cape Town the homicide rate was at its highest early in the year between January and March (23). However, most of the non-firearm homicides in England occurred during summer which they suggest could be attributed to increased hours of daylight and temperature which possibly encourages social drinking and the potential for drunken encounters (17). The period of the year is difficult to compare due to seasonal differences between South Africa and England as well as the moderate climate in South Africa and overall much higher crime rate than that of Britain (23,28).

2.2.5. Injuries

In South Africa there is a severe lack of injury-related information pertaining to homicide and more specifically blunt force homicide. International literature discussing injury characteristics is also scarce, however, Ambade et al. (18) recorded that there is usually only one body region affected in blunt force homicides with the head region being most often affected. This study compared blunt and sharp force trauma using autopsy records from a total 241 homicide cases that were autopsied at the Forensic Medicine Department of Nagpur University during 1998 to 2000. An investigation at the Irish State Pathologist's Office from 2000 to 2009 which was conducted using 377 autopsy cases of head trauma also found that blunt force injuries are principally located on the head (9). These results were mirrored by Henderson et al. (17) in a British study reporting 26% of non-firearm related homicide cases from a London state mortuary, involving blunt force trauma of which 88% showed multiple head injuries.

2.2.6. Physical crime scene location

The physical crime scene location refers to the context in which a victim was killed. It is often classified as indoors, outdoors and at home or away from home and in some instances can be indicative of the nature of the attack (17,18). An Indian study recorded that 36% of blunt force homicide victims were killed in an outdoor context and 35% in their own domicile (18). South African literature relating to the physical crime scene location is uncommon but inferences can sometimes be made by studying the victim-perpetrator relationship if it is known. In a 2003 study performed in South Africa, 42% of women were murdered in private homes compared to 32% of men (23). Henderson et al. (17) recorded that men tend more often to be killed by a stranger in a public place than women who are more often killed by a known assailant in their homes. Consequently, female victims are often killed in their domicile, while a large proportion of males are killed outdoors or away from their homes (17,19,20).

2.2.7. Presence of alcohol in victim

In South Africa alcohol abuse is a significant public health challenge with a well-recognised relationship between alcohol intoxication and interpersonal violence thereby also affecting the criminal justice system (34,35). Alcohol is a common drug detected in post mortem specimens from medico-legal autopsy cases and a recent South African study found a positive correlation between alcohol use and the occurrence of unnatural deaths (29). From the 1455 cases of unnatural death tested for alcohol, 686 (47%) tested positive with a blood alcohol level of greater than 0g/100ml. Of the 90 cases of blunt force death, 34 (38%) had a positive blood alcohol concentration (BAC) (29).

In addition to the high levels of drinking in South Africa, of greater concern is the high amount of binge drinking which is more closely associated with the risk of violence than moderate drinking patterns (36). Cape Town is one of the areas worst affected by alcohol use in South Africa with 53% of homicide cases testing positive for alcohol in 2003 (23). High levels of social drinking amongst men and women are accepted as the norm in South Africa, particularly in Cape Town, and this combined with high rates of gender violence leaves women especially vulnerable (37). In a 2006 study in Cape Town, female blunt force homicide victims were found to have high blood alcohol concentration showing 12% of female victims being mildly intoxicated (0.01-0.04g/100ml), 15% intoxicated (0.05-0.14g/100ml) and 56% severely intoxicated (>0.15g/100ml) (37). This highlights the risks involved, specifically for women, in heavy episodic drinking.

2.3. Context of the Study

Salt River Mortuary is an M6 Academic facility which processes an average of 3000 cases a year. It services the West Metropole of the City of Cape Town (38) and is comprised of the Western, Southern, Klipfontein and Mitchells Plain districts (Figure 2-1). The Western district includes the City Bowl and West Coast areas, the Southern district is made up of the Atlantic Seaboard, Southern Peninsula and Southern Suburb areas and the Cape Flats is partially represented and covers the Klipfontein and Mitchells Plain districts. The Cape Flats is a geographical area that is serviced by both Salt River and Tygerberg Forensic

Pathology Mortuaries. The Klipfontein and Mitchells Plain districts fall within the catchment area of Salt River Mortuary and are collectively referred to as the Cape Flats in this study (Figure 2-1). There is a wide disparity of homicide rates amongst the areas of the West Metropole of the City of Cape Town, where the Southern peninsula usually has relatively low levels of homicide compared the Cape Flats, which is the area most severely affected by homicide (27,28). Poor socioeconomic status has been shown to be correlated with high rates of homicide (36,39). The Salt River Mortuary services areas of both high and low socioeconomic status as depicted in the map in Figure 2-2. Areas of low economic status typically correlate to areas with a high crime rate. This is especially true for the informal settlements within the West Metropole of the City of Cape Town, many of which are located in the Cape Flats area, which has high rates of homicide victimisation particularly in young men (40). These differences may be attributed to differences in socioeconomic status as well as relative population sizes. A possible explanation for this is the staggeringly high levels of gang activity that are endemic to this area (6).



Figure 2-1. Western Cape Metro Health District area map including West Metropole of the City of Cape Town areas. Catchment area for Salt River mortuary is outlined in red.

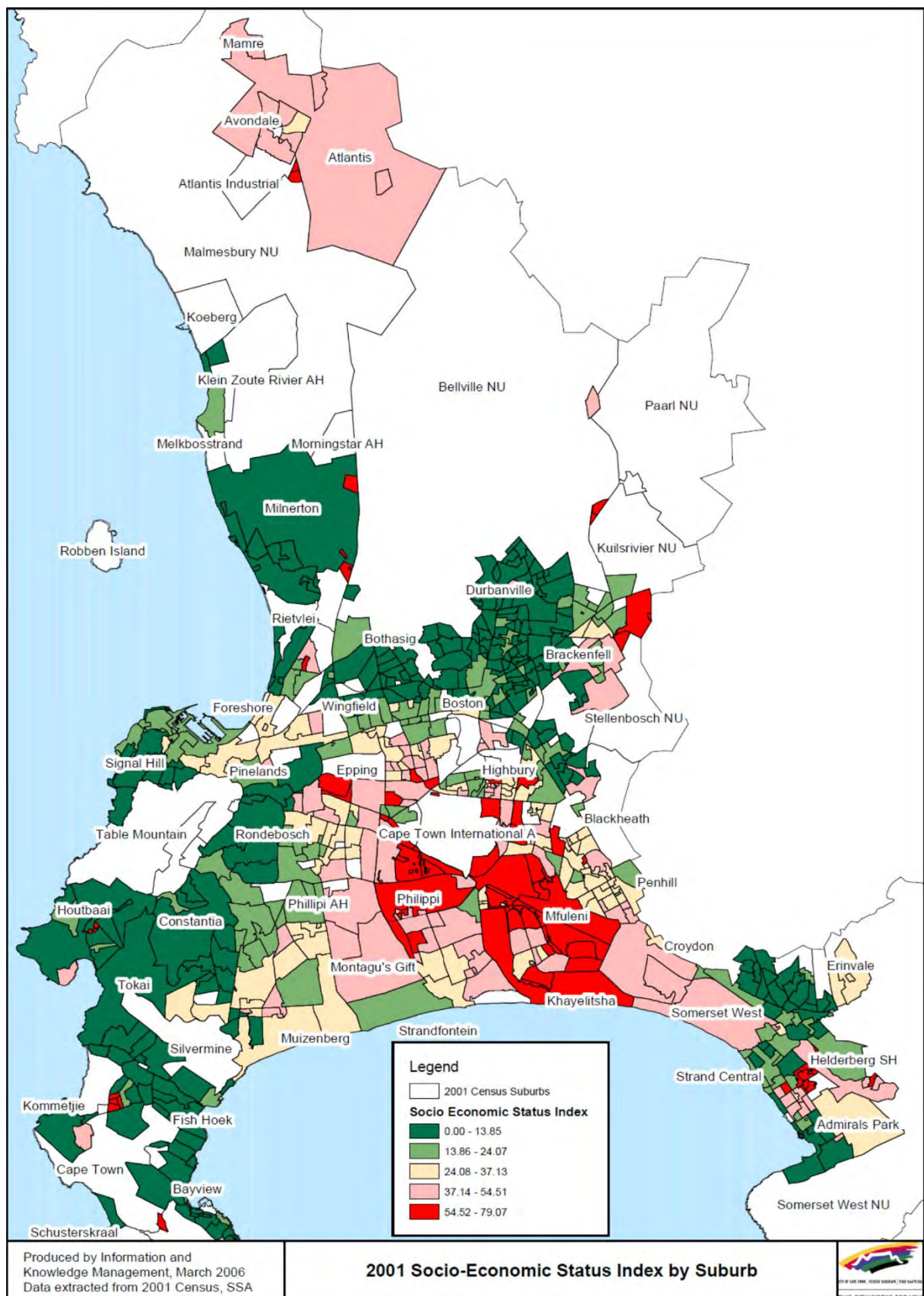


Figure 2-2. A 2001 Census Map representing the socio-economic status of suburbs in the Cape Town area. The areas in red are indicative of poor socio-economic status while those in green represent high socio-economic status.

2.4. Relevance and Future Study

South Africa is a country where violence is rife, especially in Cape Town where murder is the second highest contributor to unnatural deaths (23,25), a portion of which are caused by blunt force trauma (28). It is evident that in the South African context, violence reduction is a health priority that requires inter-sectoral interventions by the judicial system, police and the health sectors (26). To this end an increase in the availability of accurate and timely data is required for the effective response to the high injury and violence burden on the community (25,39). Mortuary data is able to provide a complete and accurate record of mortality to increase the understanding of the circumstances surrounding death and better reduce or cope with them. Due to the statutory requirement in South Africa for a post-mortem examination in cases of non-natural mortality (41), there is scope for a detailed database on unnatural deaths, provided the collected medico legal data is shared with health information systems on a provincial and/or national level (28).

South African homicide and injury literature tends to focus on age and gender, body regions involved, assailant-victim relationship, location of the crime scene and further toxicological analysis of the victim's tissue (18,20,21). However, not all literature on fatal blunt force trauma is directly comparable because nationally there is a lack of centralised information pertaining to blunt force deaths. Hence research is gathered from a variety of data sources such as police dockets, hospital records and autopsy reports (23). There are also gaps in the investigation reports with regards to the location of an attack versus the location of death, the specific weapon/s used to inflict the injuries and the extent of the injuries, especially as these characteristics pertain to blunt force trauma. Furthermore, very few studies report the statistical significance of the recorded proportions and proportions which are generally not compared to population data to determine whether the distribution seen in the study is merely due to population proportions.

The exploration and analysis of further characteristics and prevalence associated with blunt force trauma could assist in the implementation of appropriate interventions targeted at specific areas or individuals. Additionally it can direct research toward topics in blunt force trauma which are in need of investigation such as locality of the crime

scene, extent of the injuries sustained, weapons commonly used, and the victim-assailant relationship.

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Chapter Three: Publication Ready Manuscript

Patterns of blunt force homicide in the West Metropole of the City of Cape Town, South Africa

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3.1. Abstract

There is currently a paucity of information regarding the prevalence and characteristics associated with blunt force trauma related homicides in South Africa. Information relating to the patterns of blunt force trauma could assist in the implementation of appropriate interventions targeted at specific areas or individuals. Furthermore it can direct research toward topics in blunt force trauma which are in need of investigation. As such the primary objective of this study was to determine the prevalence of blunt force trauma related homicides in the West Metropole of the City of Cape Town, South Africa. The secondary objective was to describe the characteristics associated with blunt force trauma related homicides in the West Metropole of the City of Cape Town, South Africa.

The study was a retrospective review of autopsy reports obtained from Salt River mortuary from 1 January 2013 to 31 December 2014. The prevalence of blunt force trauma was considered for unnatural deaths with a focus on homicide. The inclusion criteria were cases where the cause of death was blunt force trauma as determined by the pathologist. Cases in which the death was not caused solely by blunt force trauma were classified as combination deaths, and cases involving deaths due to blunt force trauma as a result of falling from a height, train-related, pedestrian or motor vehicle accidents have been excluded.

A total of 3346 and 3461 cases of unnatural deaths occurred in the West Metropole of the City of Cape Town in 2013 and 2014 respectively. 247 (7.4%) cases in 2013 and 277 (8%) cases in 2014 involved blunt force injuries, and of these cases 183 (5.5%) in 2013 and 201 (5.8%) in 2014 were classified as homicides. The results of the characteristics of blunt force homicide analysed in this study broadly concur with previous studies undertaken in South Africa, with some areas of divergence. Additional features that have not been covered in previous studies also emerged, which could possibly form the basis for future investigations.

Keywords: Blunt force trauma, homicide, Cape Metropole

3.2. Introduction

Globally trauma is considered one of the most common forms of homicide and is frequently categorised into three main groups according to the mechanisms of trauma, namely: blunt, sharp and ballistic trauma. Extensive research on wound pathology has been conducted to better distinguish between the trauma mechanisms in order to provide information pertaining to the weapon type so as to clarify the events surrounding death (1,2). The wound morphology in blunt force trauma cases varies based on the weapon used, the force with which it was applied and the affected body region (1,3). Fatal blunt force trauma injuries are usually the consequence of blows from fists and feet or a variety of blunt implements such as household hammers, wooden clubs or bats (4). Some cases of blunt force trauma may not lead to instantaneous death but rather death after a delayed period of days, weeks or months in which case difficulties may arise in the determination of whether an individual is at fault (5).

In the South African context, violence is rife. This is especially the case in Cape Town where homicide is the second highest contributor to unnatural deaths (6,7). Previous research has suggested that the largest proportion of homicide deaths in Cape Town are due to sharp force and firearms, however blunt force trauma forms a significant portion of unnatural deaths (8). In some cases of homicide a combination of injuries are present, especially if the assault was carried out by multiple aggressors as is frequently seen in cases of mob violence which is prevalent in the Western Cape (8).

Literature tends to focus on age and gender, location of injuries, number of body regions involved, defence injuries, weapon, assailant-victim relationship, location of the crime scene and further toxicological analysis of the victim's tissue (9-11). However, not all literature on fatal blunt force trauma is directly comparable because nationally there is a dearth of centralised information pertaining to blunt force deaths, hence research is based on data gathered from a variety of resources such as police dockets, hospital records and autopsy reports (6). Furthermore, very few studies report the statistical significance of the recorded proportions and proportions are generally not compared to population data to determine whether the distribution seen in the study is merely due to regional population proportions. Information relating to the patterns of blunt force

trauma could assist in the implementation of appropriate interventions targeted at specific areas or individuals. Additionally it can direct research toward topics in blunt force trauma which are in need of investigation.

In South Africa, there is currently a paucity of information regarding the prevalence and characteristics associated with blunt force trauma related homicides. Therefore, the principal objective of this study was to determine the prevalence of blunt force trauma related deaths and homicides in the West Metropole of the City of Cape Town, South Africa. The secondary objective was to describe the characteristics associated with blunt force trauma related homicides in the West Metropole of the City of Cape Town, South Africa.

3.3. Methods

The study is a retrospective review of autopsy reports obtained from Salt River mortuary during the years 2013 and 2014, from 1 January 2013 to 31 December 2014. Salt River Mortuary is an M6 Academic facility which processes an average of 3000 cases a year. It services the West Metropole of the City of Cape Town which is comprised of the Western, Southern, Klipfontein and Mitchells Plain districts (12). The Western district includes the City Bowl and West Coast areas, the Southern district is made up of the Atlantic Seaboard, Southern Peninsula and Southern Suburb areas and part of the Cape Flats covers the Klipfontein and Mitchells Plain districts.

The prevalence of blunt force trauma was considered for unnatural deaths with a focus on homicide. The inclusion criteria were cases where the cause of death was blunt force trauma as determined by the pathologist. Cases in which the death was not caused solely by blunt force trauma were classified as combination deaths. Cases involving deaths due to blunt force trauma as a result of falling from a height, train-related, pedestrian and motor vehicle accidents were excluded.

In each case, the characteristic data was collected and recorded into a Microsoft® Office Excel® 2013 (Microsoft, Redmond, Washington, US) database. Stata Ver 13.1 (StataCorp, TX, USA) was used to perform descriptive statistics to identify the presence of patterns

and commonalities for each characteristic. Pearson's goodness of fit test was used to assess whether individual proportions were equal and Pearson's Chi-squared (χ^2) tests were used to assess the association among groups of characteristics. Population data for the relevant drainage area was obtained from the 2011 Census data compiled by StatsSA (13).

Ethics Committee approval for this study was obtained from the Human Research Ethics Committee (HREC) of the Faculty of Health Sciences at the University of Cape Town (HREC Ref: 313/2015).

3.4. Results and Discussion

3.4.1. Prevalence

A total of 3346 and 3461 cases of unnatural deaths occurred in the West Metropole of the City of Cape Town in 2013 and 2014 respectively, of which 247 (7.4%) cases in 2013 and 277 (8%) cases in 2014 involved blunt force injuries. In total, 183 (5.5%) and 201 (5.8%) deaths due to blunt force trauma were classified as homicides in 2013 and 2014 respectively. The mean prevalence over the two year period was 13.53/100 000 population for unnatural blunt force trauma deaths and 9.91/100 000 for blunt force trauma homicides. There was no significant difference in the prevalence of blunt force trauma nor blunt force trauma homicides between the years (blunt force trauma: $P=0.336$; blunt force trauma homicide: $P=0.545$). Between 2013 and 2014 there was no significant difference in the 56 (30.6%) and 58 (28.9%) homicides that were a consequence of a combination of blunt and sharp force trauma ($P=0.707$). Due to the lack of centralised data focusing on blunt force trauma homicides, it was difficult to make comparison of these results to previous results in the country. These figures of 5.5% and 5.8% prevalence are less than the 14% reported by Matzopoulos in 2003 (6). This could be due to the Matzopoulos study having considered all blunt force trauma related deaths in South Africa as a whole with no specific focus on homicide (6). It is understood that motor vehicle collisions are a major burden on health services world-wide, particularly in developing countries (14–16). The difference between these results and those reported by Matzopoulos et al. (6) may therefore primarily be due to the inclusion of

injuries seen in motor vehicle collisions. A more recent study in Pretoria in 2014 reported that 6.19% of unnatural deaths were caused by blunt force trauma (17). This study performed an analysis of non-natural deaths for which alcohol analysis was performed, in which approximately 62% of the total cases had samples taken for alcohol analysis (17).

3.4.2. Age of victim

In this study the mean age of the victims in 2013 was 31.75 years with a standard deviation of 12.44 years, the principal age group being 20 – 29 years (35%). In 2014 the mean age was 29.76 years associated with a standard deviation of 10.55 years, the principal age group also being 20 – 29 years (43%). There was no significant difference in the proportion of cases falling within the principal age group between 2013 and 2014 ($P=0.145$). The distribution of cases across age groups for both years can be seen in Figure 3-1. Both years reflect widely distributed victim ages ranging from 0 to 81 years in 2013 and 0 to 74 years in 2014.

The overall age distribution of the victims of blunt force trauma homicide is significantly different to the age distribution of the overall intake from Salt River Mortuary. The overall intake at Salt River Mortuary is composed primarily of cases of unnatural death with a portion of natural death cases. Individual differences can be seen in Table 3-1 with the most at risk group being the 20 – 29 year age group. The results of the current study are analogous with those from South Africa in 2003 and 1994 where the age group 25 – 29 and 25 - 34 years had the highest number of recorded homicides respectively (6,15). The predominant age group of homicide victims recorded in South African studies (6,15) is slightly younger than those reported in British (30-39 years) (4) and Indian (31-40 years) (10) studies, a conceivable explanation for this is the involvement of younger people in gang activity and violence, as is often the case in the Western Cape (8,18,19).

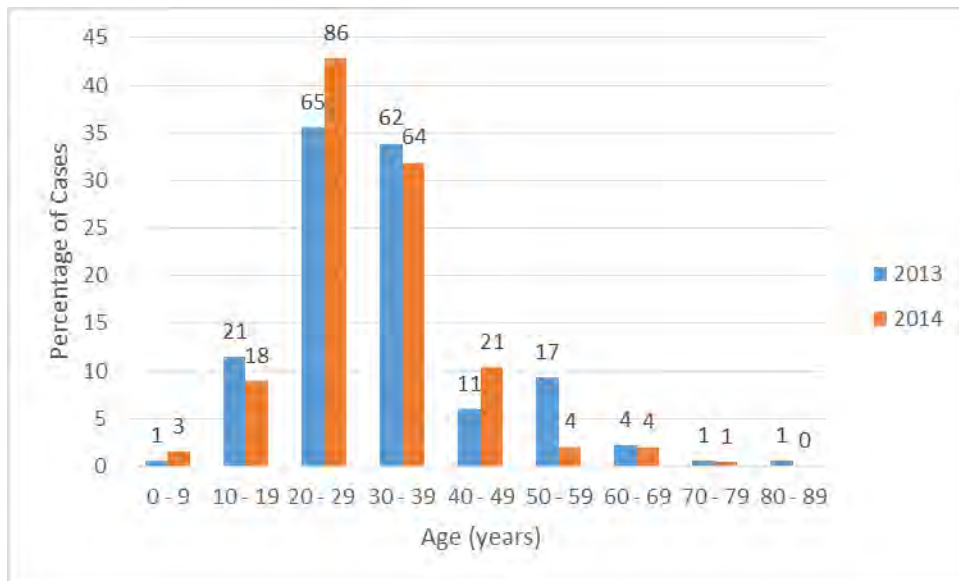


Figure 3-1. Percentage age distribution of victims of blunt force trauma homicide during 2013 and 2014. Numbers above bars represent number of cases.

Table 3-1. Comparison of the age distribution between blunt force homicide cases and the overall intake from Salt River Mortuary for the years 2013 and 2014.

Age Category	Blunt Force Trauma Homicide %	Salt River Mortuary Intake %	P-value
0 - 9	1,04	12,84	< 0,001
10 - 19	10,16	6,75	0,0106
20 - 29	39,32	24,62	<0,001
30 - 39	32,81	19,85	<0,001
40 - 49	8,33	12,23	0,0225
50 - 59	5,47	9,90	0,0043
60 - 69	2,08	7,28	<0,001
70 - 79	0,52	3,87	0,0007
80 - 89	0,26	2,31	0,0077
89 - 90	0,00	0,36	0,2389

3.4.3. Gender

It is accepted that there are a greater number of male compared to female homicide victims (4). The results of previous studies show the male to female ratio for all homicides in the city of Cape Town was reported as 8.5:1 in 2003(6). Similarly, a study conducted on blunt force homicide in India noted a male to female ratio 6.6:1 (10). The explanation for this is multifaceted and based on complex socio-biological interactions (20). A study in the United States used “sexual selection evolutionary theory” to explain

the overrepresentation of young, unemployed, single male homicide victims and offenders (21). This trend has subsequently been referred to as hegemonic masculinity and can be interpreted as young men tending to be more aggressive and competitive. Hence more likely to be victims or perpetrators of violence, because of the evolutionary context of reproductive competition (18). Evolutionary theory was included in a model developed using data from 18 developed democracies, whereby the gender-gap associated with homicide is attributed to gender differences in roles and status (20). This model included the degree of exposure to potential offenders and the prevalence of conflict amongst the population. In the South African context, there are high levels of conflict within a population associated with male dominance (18).

The current study showed that there were significantly more male victims than female victims of blunt force homicide for both years ($P < 0.001$), with no significant difference in the gender ratios of 2013 and 2014 ($P=0.298$). In 2013, 93% of victims were male and 7% female, a ratio of 14.25:1 and in 2014, 91% of victims were male and 9% female, a ratio of 9.58:1. In comparison the reported ratio of male to female victims of blunt force homicide in the Cape Metropole during the year 1994 was 6.6:1. (15).

The results of the current study show a significant overrepresentation of male victims of blunt force trauma homicide when compared to the overall intake at Salt River Mortuary for the respective years which was comprised of 78% males and 22% females. This suggests that males are more at risk from blunt force homicide than females (Table 3-2). The high levels of males involved in blunt force trauma, as well as homicide in general, in the West Metropole of the City of Cape Town could be due to the high levels of gang violence in which men are usually more heavily involved than women (8,18).

Table 3-2. Comparison of the gender distribution of blunt force trauma homicide cases for both years of study and the overall intake from Salt River Mortuary for both years of study.

Gender	Blunt Force Trauma Homicide %	Salt River Mortuary Intake %	P-value
Male	91,93	78,05	<0,001
Female	8,07	21,95	<0,001

3.4.4. Day and month of death

On examination of the blunt force homicides on the days of the week it was found that there was an association for both years between the distribution of cases and the days of the week (2013: $P=0.002$; 2014: $P=0.008$). The highest number of blunt force homicides occurred on Sundays with 42 (23%) and 43 (21%) cases occurring on Sundays in 2013 and 2014 respectively (Figure 3-2). The number of homicides that occurred during the weekend accounted for 42% of the total number of blunt force homicide cases in 2013 and 38% in 2014. These results resemble that of 49% of all homicides taking place during the weekend in Cape Town in 2003 (6). It is thought that this trend could possibly be attributed to people spending more time taking part in social drinking over the weekend (4). Evidence of this pattern can be seen in Figure 3-3, which demonstrates that Sundays had the highest number of cases with mild to severe intoxication. In addition to research suggesting a correlation between the homicide rate and days of the week there is also a possible association between certain months or seasons of the year. A British study found the homicide rate increases during the warmer summer months (4) which is contrary to the results produced in this study which showed no recognisable pattern between 2013 or 2014 for the distribution of blunt force homicides over the course of the year. A possible explanation for this may be the moderate climate in South Africa and overall much higher crime rate in comparison with Britain (6,15).

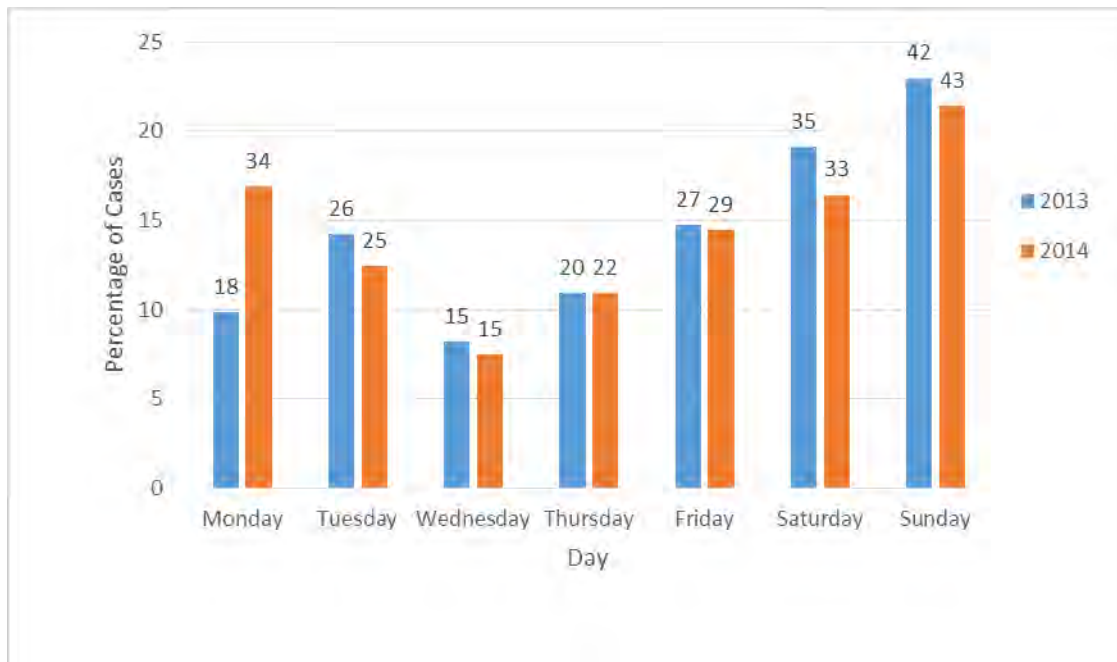


Figure 3-2. Percentage distribution of blunt force homicide cases during the days of the week in 2013 and 2014. Numbers above the bars represent number of cases.

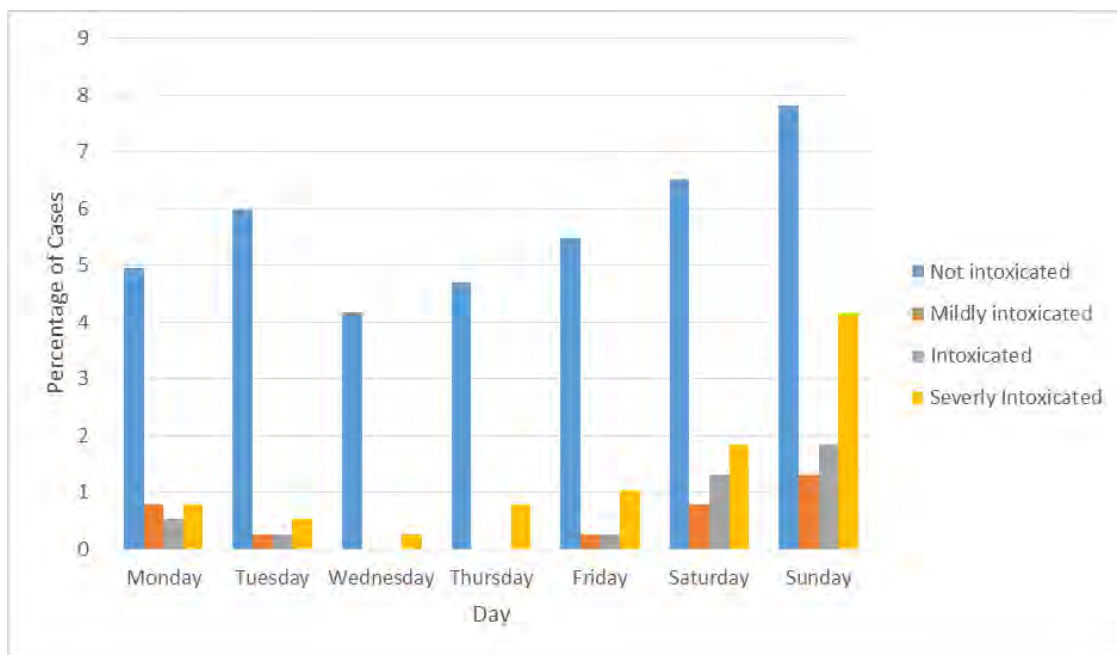


Figure 3-3. Percentage distribution of intoxication levels during the week as a percentage of the total cases for 2013 and 2014.

3.4.5. Number and location of injuries

Similar injury profiles were evident for both years of study. There was an average number of 10 injuries per case for both 2013 and 2014 and the mean number of injuries per case was 12.58 in 2013 and 12.83 in 2014 which was associated with standard deviations of 11.11 and 11.44 respectively (Table 3-3). The minimum and maximum number of blunt force injuries was 0 and 66 respectively in 2013 and 0 and 58 respectively in 2014 (Table 3-3). The cases with no injuries were indicative of cases where no visible signs of blunt force trauma were present externally. Very high numbers of injuries were mostly in cases with extensive areas of abrasion. Cases where the number of injuries was unknown refers to cases where the victim was severely burned post-mortem. In cases where sharp force trauma was also present fewer sharp force injuries were generally evident as compared to blunt force injuries. A possible reason for this could be that the study focused primarily on blunt force attacks so sharp force injuries may have been incidental in nature and seen to a lesser extent. Information pertaining to the number of assailants and weapons used was not uniformly reported or available but cases showing multiple combination injuries are thought to possibly be associated with multiple aggressors as in cases of community assault which is common in the Western Cape (8,22).

During the period of investigation, many victims sustained a high number of injuries, the location of which tended to be spread over the body. The head was the body region most often showing signs of blunt force trauma with over 90% of cases for both years involving the head (Table 3-3). This trend was demonstrated over both years of study as a total of 29 (16%) cases in 2013 and 32 (16%) cases in 2014 showed the head to be the only injured body region whilst 137 (75%) cases in 2013 and 152 (76%) cases in 2014 demonstrated injury to the head in addition to other regions (Figure 3-4).

Defensive injuries could contribute to the large number of wounds located on the arms which accounted for the arms being the second most affected body region in blunt force attacks. The high number of cases involving the head echoes Ambade et al. (2006) who recorded 81% of cases of blunt force homicide involved the head (10). Of the cases that also demonstrated sharp force trauma the head was involved to a lesser degree as 23 (41%) cases in 2013 and 31 (53%) cases in 2014 did not affect the head at all as opposed to the 17 (9%) and 17 (8%) cases that did not affect the head at all for the blunt force

injuries in the corresponding years. A more complete injury profile of blunt force attacks would be possible if hospital records and autopsy reports were combined in order to capture injury information of victims who survive blunt force attacks.

Table 3-3. Distribution of the number of blunt force injuries per case in 2013 and 2014 and the regional distribution of the blunt force injuries.

Year	Number of Injuries/Case				Regional Distribution N (%)						
	Mean	SD	Min	Max	Head	Neck	Chest	Back	Legs	Arms	Abdomen
2013 N=183	12,58	11,01	0	66	166 (91%)	41 (22%)	74 (40%)	61 (33%)	106 (58%)	109 (60%)	34 (19%)
2014 N=201	12,83	11,45	0	58	184 (92%)	53 (26%)	79 (39%)	74 (37%)	104 (52%)	130 (65%)	43 (21%)

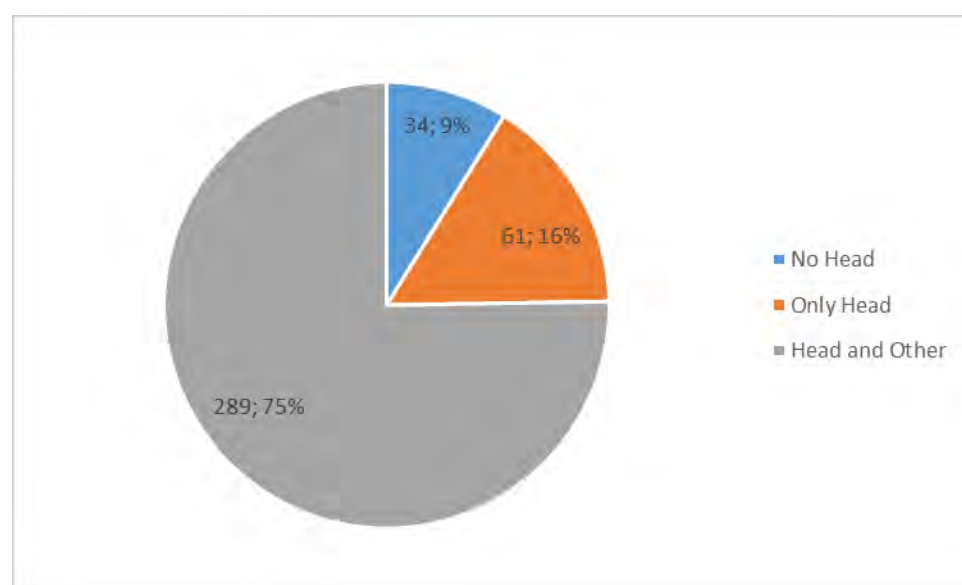


Figure 3-4. Percentage of total number of cases with blunt force injuries involving the head during 2013 and 2014. Numbers in each segment represent number of cases with the corresponding percentage.

3.4.6. Geographical crime scene area

In the West Metropole of the City of Cape Town, the Cape Flats was the most heavily affected geographical area in both years of study contributing 122 (66.67%) and 141 (70%) homicide cases in 2013 and 2014 respectively ($P < 0.001$), with no significant difference between the years ($P = 0.463$). These figures are in accordance with the high

reported rates of homicide in the Western Cape (23). Poor socio-economic status has been shown to be correlated with high rates of homicide (16,24). The current study therefore concurs with the finding of elevated levels of homicide in poor socio-economic areas.

A couple of cases indicate crimes occurring in the Boland (1 case) and Winelands (1 case) areas. These areas do not typically form part of the catchment area for Salt River mortuary, however in these cases the individuals were transferred to hospitals within the catchment area where they subsequently died.

3.4.7. Physical crime scene location

The physical location of the crime scene refers to the physical context of the crime scene and was categorised as formal housing (indoors), informal housing (indoors), outdoors, other (medical facilities, bars and shops) and unknown. There was no significant difference between the years of study for the physical crime scene location of blunt force homicides ($P=0.421$). As seen in Figure 3-5, a significant proportion of victims were killed in an outdoor context, compared to those killed at other locations (51% in 2013, 47% in 2014; $P<0.001$). Although there was a much higher proportion of male than female victims, when the number of cases per physical crime scene location was analysed separately for each gender a difference in the proportional distribution of female and male victims was noted. Although the association was not significant, in 2013 a greater proportion of female victims (41.67%) were killed indoors in formal or informal housing compared to 11.69% of male victims ($P=0.054$) (Figure 3-6). In 2014 a significant proportion of female victims (26.32%) were killed indoors in formal housing compared to 4.95% of male victims ($P=0.038$) (Figure 3-6). These results correspond to English and South African studies which conclude that a greater percentage of women than men are killed in their domiciles (4,6). A reason put forward for this global trend is the difference in the interaction of sociobiological factors and gender roles within society, leading to men being more likely than women to interact aggressively, especially with strangers away from their homes (20).

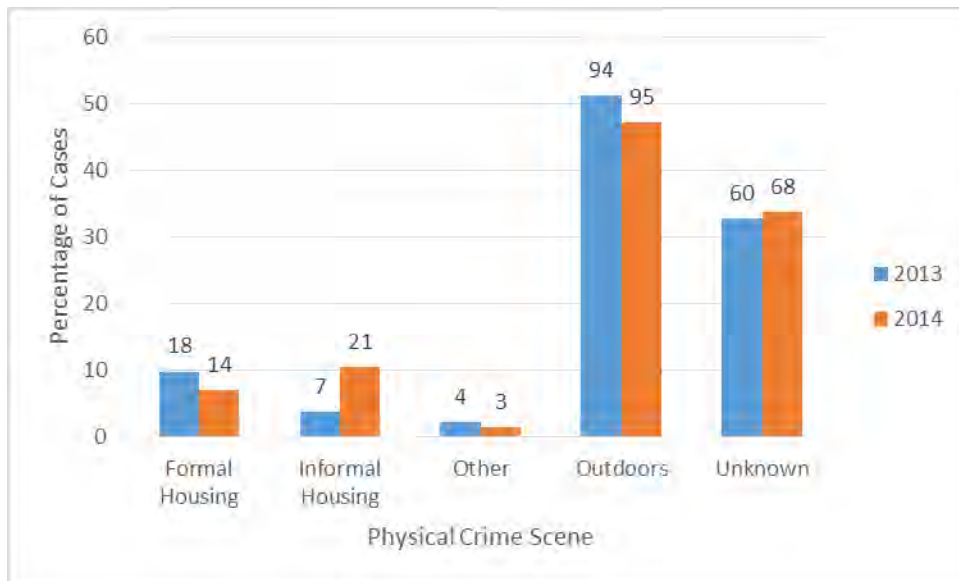


Figure 3-5. Percentage distribution of total number of victims in physical crime scene context. Numbers above the bars represent number of cases.

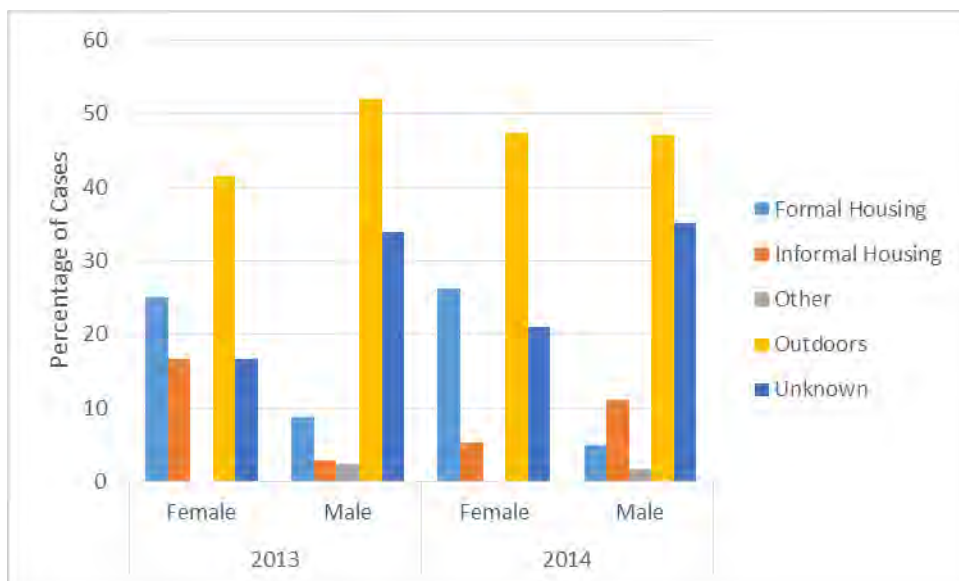


Figure 3-6. Percentage of victims of each gender and the physical context of the crime scene.

3.4.8. Presence of alcohol in victim

It is accepted that alcohol use and intoxication is a key risk factor for homicide, with Cape Town having a larger number of alcohol positive cases compared to other areas in South Africa (6). The blood alcohol concentration (BAC) of victims of blunt force trauma was expressed in grams per 100 millilitres of blood (g/100ml) and was classified into four

groups based on the South African legal driving blood alcohol level, namely: not intoxicated (0g/100ml), mildly intoxicated ($0 < 0.05\text{g}/100\text{ml}$), intoxicated ($0.05 < 0.15\text{g}/100\text{ml}$) and severely intoxicated ($0.15 < 0.4\text{g}/100\text{ml}$). In 2013 the blood alcohol concentration was unknown for 78 (43%) cases due to no alcohol analysis having been conducted. However, out of the 105 cases with a known BAC, 72 (39%) victims were not intoxicated, the 33 (31%) victims who were intoxicated had a mean BAC of 0.16g/100ml ranging from 0.01 – 0.37g/ 100ml of which 20 (11%) showed signs of severe intoxication (Figure 3-7). The 2014 data followed the same trend as that of 2013 with the largest number of cases (89; 44%) having unknown BAC, the second largest group was 80 (40%) cases where the victims were not intoxicated, the 32 (16%) intoxicated victims had a mean BAC of 0.15g/100ml ranging from 0.01 – 0.3g/ 100ml of which 16 (8%) showed signs of severe intoxication (Figure 3-7). In a 2014 study in Pretoria 38% of blunt force trauma cases had positive BAC with a mean BAC of 0.13g/100ml (17).

Whilst there was no significant association between age and BAC, the highest levels of intoxication were in the 30 – 39 years age category in 2013 and in the 20 – 29 years age category in 2014 with severe intoxication occurring more frequently than mild intoxication and intoxication within these age groups. Male victims showed BAC across all the intoxication levels, whilst females did not. Due to the small number of female blunt force trauma victims in this study it was difficult to make associations between female victims and alcohol use, however the 33% of severely intoxicated females is less than the results seen by Mathews et al. in which 56% of female blunt force trauma victims in the Western Cape were severely intoxicated (25). Differences between these results could be due to the specific nature of inclusion factors in this study which only included victims of blunt force homicide as opposed to all types of homicide.

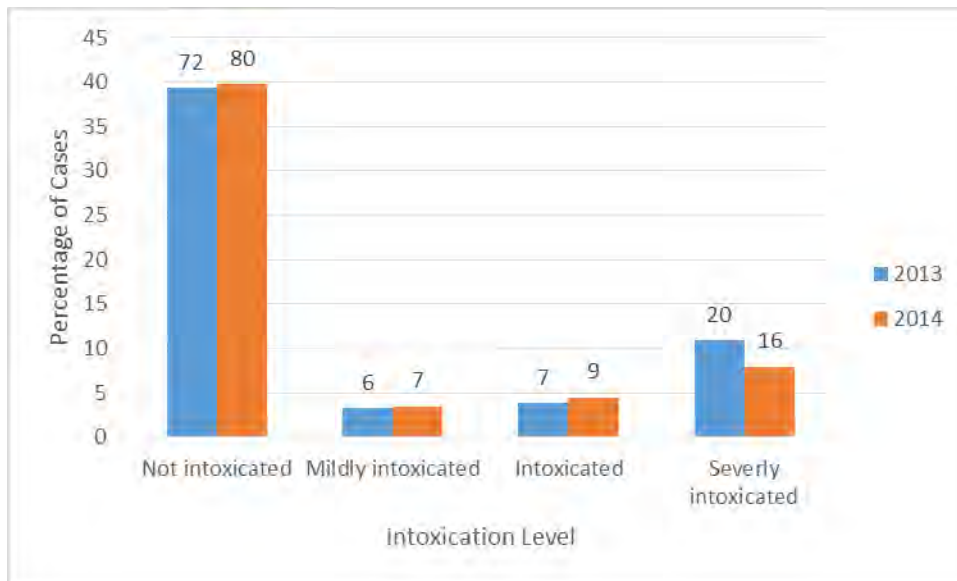


Figure 3-7. Percentage distribution of the blood alcohol concentration levels in victims of blunt force trauma. Numbers above the bars represent number of cases.

3.4.9. Limitations

The current study is limited to a two year period from 2013 to 2014. These years were selected for retrospective review in order to cover as recent a time period as possible while allowing enough time for the return of toxicological analysis. Whilst the results of each analysed characteristic are statistically similar, extending the period of study would allow for increased confidence in the observed patterns.

The population data was based on the 2011 Census data for the District municipality of the City of Cape Town because it was the most accurate and recent estimate of the population included in the study. However, this area is larger than the catchment area of Salt River Mortuary from where the analysed cases were obtained. To address this issue in future studies, autopsy reports from Tygerberg Mortuary can be included in the analysis in order to extend the area of study to cover the area of the District municipality of Cape Town.

The current study did not report on offender-victim relationship. However, such information may provide further insights to the events surrounding death and should be considered in future research by investigating police dockets in association with autopsy reports. Examining police dockets may also provide more information relating to the type

of weapon(s) used which are not typically available in autopsy reports. Furthermore, a more complete injury profile of blunt force trauma will be possible if autopsy reports were analysed in conjunction with hospital records. This will provide better understanding of fatal and non-fatal blunt force trauma injuries because some of the victims of blunt force trauma attacks do not die from their injuries.

3.5. Conclusion

The results of this study broadly concur with previous studies undertaken in South Africa. There were some areas of divergence, but also the emergence of features not covered in previous studies which could possibly form the basis for future investigation or intervention (6,15,17). In the West Metropole of the City of Cape Town the prevalence of blunt force trauma was 7.4% in 2013 and 8% in 2014 and the prevalence of blunt force trauma homicide was 5.5% in 2013 and 5.8% in 2014. The majority of the victims were young males from the Cape Flats. This area has poor socio-economic status and could be in need of interventions, especially for young men. Interventions could include increased police presence during the weekend. There was a high number of injuries associated with blunt force homicides especially located on the head, which highlights the importance of focusing resources and research on cranial trauma. Valuable insight can be gained from further analysis into the role of alcohol intoxication in blunt force trauma related deaths as well as the physical crime scene location which could narrow down high risk areas most in need of intervention. In relation to this the presence of medical intervention can be included in future investigations to determine the role it has on the survival of victims of blunt force attacks.

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Chapter Four: Appendices

4.1. Acknowledgments

I would like to acknowledge the National Research Foundation (NRF) for awarding me the NRF Freestanding Masters Scholarship for the year in which I completed this project.

I have been fortunate to have supportive and encouraging supervisors who have made the compiling of this mini-thesis an interesting and exciting process.

Mr. Calvin Mole and Dr. Marise Heyns played a supervisory role in the compilation of this mini-thesis. I would like to acknowledge Mr. Calvin Mole for his availability, advice and encouragement throughout the research, analysing and writing of this thesis. His enthusiasm was contagious and I am grateful to have had the chance to learn from him.

I would also like to thank Dr. Marise Heyns for her contextual thinking and backing of all my academic pursuits. The people in the Forensic Medicine and Toxicology department have been generous with their time and their constructive comments have been much appreciated.

Finally, the support of my family and friends has been much appreciated, especially Wes who has endured more unsavoury dinner talk than is probably appropriate.

4.2. HREC Approval Letter



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



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Observatory 7925
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Email: nosi.tsama@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

04 June 2015

HREC REF: 313/2015

Mr C Mole
Forensic Medicine & Toxicology
Falmouth Building
Entrance 2, Level 5

Dear Mr Mole

PROJECT TITLE: PATTERNS OF DEATH DUE TO BLUNT FORCE TRAUMA (MPhil-candidate-C Clark)

Thank you for your response to the Faculty of Health Sciences Human Research Ethics Committee dated 26th May 2015.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30th June 2016.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, Courtney Clark will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

PROFESSOR M. BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH

2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki guidelines.
The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

4.3. Population Data for West Metropole of the City of Cape Town Suburbs

This population data from the City of Cape Town was based on the StatsSA population data from the 2011 Census and provides population data for the suburbs within the West Metropole of the City of Cape Town. The data can be accessed via the following url: <http://www.capetown.gov.za/en/stats/Pages/2011-Census-Suburb-Profiles-land.aspx>

Suburb	Population
Acacia Park	817
Athlone	45 048
Atlantis Non-Urban	2479
Atlantis	67491
Bergvliet	4428
Bishopscourt	1603
Bloubergstrand	11179
Bonteheuvel	52956
Bothasig	11790
Brooklyn	10941
Camps Bay	4982
Cape Peninsula National Park	286
Cape Town CBD	5647
Capri	3061
Capricorn	4458
Castle Rock	5595
Century City	4239
Claremont	17198
Clifton	507
Clovelly	559
Coniston Park	1833
Constantia	12454
Crossroads	36043
Da Gama Park	2346
Diep River	2515
Dreyersdal	2130
Edgemoed	9884
Epping Industria	50
Fairways	2952
Fish Hoek	9052
Foreshore	762
Gardens	7960
Glencairn	1574

Grassy Park	19212
Green Point	9301
Gugulethu	98468
Hanover Park	45497
Hazendal	4995
Heathfield	7226
Heideveld	21288
Hout Bay	17329
Imizamo Yethu	15538
Joe Slovo Park	12629
Kalk Bay	700
Kennilworth	10872
Kensington	24161
Kirstenhof	4515
Kleine Zout Rivier Small Holdings	283
Knole Park	2961
Kommetjie	3341
Lakeside	3801
Langa	52401
Lansdowne	18650
Lavenderhill	32598
Llandudno	571
Lotus River	38143
Maitland Garden Village	1834
Maitland	9782
Mamre	9048
Manenberg	61615
Marconi Beam	37
Marina da Gama	3390
Masiphumelele	21904
Meadowridge	3194
Melkbosstrand	11303
Milnerton Non-Urban	3293

Milnerton	14306
Mitchells Plain	310485
Montague Gardens	22
Monte Vista	7023
Mowbray	4726
Muizenberg	5537
Ndabeni	1014
Newlands	5100
Noordhoek	4424
Nyanga	57996
Observatory	9207
Ocean View	13569
Oranjezicht	3580
Ottery	17942
Oude Molen Village	530
Paarden Eiland	11
Parklands	24614
Parkwood	11870
Pelikan Park	12552
Pella	1681
Philippi	191025
Philippi Small Holdings	6618
Phoenix	4219
Pinelands	14198
Plumstead	20178
Pollsmoor	2161
Red Hill	1016
Retreat	35709
Robben Island	116
Rondebosch/Rosebank	19554
Rugby	4431
Ruyterwacht	10773
Salt River	6577
Scarborough	1075
Schotschekloof	3203

Sea Point	16164
Sheraton Park	3111
Silvertown	27146
Simons Town	2649
Southfield	7106
St James	491
Steenberg Estate	796
Steenberg	4168
Stonehurst Mountain Estate	678
Summer Greens	6275
Sun Valley	4869
Sunningdale	5299
Sybrand Park	1613
Table Mountain Nature Reserve	114
Table View	25977
Tamboerskloof	2984
Thornton	5862
Tijgerhof/Sanddrift	6178
Tokai	3664
University of Cape Town	471
V & A Waterfront	1570
Vissershok	323
Vredehoek	5415
Vrygrond	18498
Westlake	6452
Wingfield	3129
Woodstock	12656
Wynberg	14472
Youngsfield	887
Ysterplaat Airbase	838
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4.4. Instructions to Authors



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1. Original Research Articles (Regular Papers)
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- Sexing
- Aging sub adult skeletal remains
- Aging adult skeletal remains
- Aging living sub adults and adults
- Determining ancestry
- Stature estimation
- Facial reconstruction

- Non metric trait distribution, pathology and trauma
- Positive identification of human skeletal remains
- Positive identification of the living

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